CALFED Bay-Delta Program
Veale/Byron Tract Work Group Meeting
Wednesday, September 8, 1999

Meeting Notes

Program Overview

Stein Buer (CALFED) gave a brief review of the CALFED program and its current status. Judy Heath (CALFED) summarized the South Delta Water Quality bundle of actions. The CALFED Water Quality Program has been in development for over three years with extensive involvement of a large group of diverse stakeholders. Veale Tract/Byron Tract water quality action is one of the four high priority actions selected for the early implementation program in Stage 1. It is a result of an extensive selection process with substantial stakeholders' input at various stages.

CALFED has not committed to funding specific actions at this point. However, a key to the success of the water quality program is to develop priority actions to a stage that would render it competitive when federal and state funding become available.[1] Details of the funding mechanism and selection process have yet to be decided. Some stakeholders expressed concerns that it would be difficult for entities other than CALFED agencies to obtain funding.

Veale Tract

Problem Definition

The tidal flow characteristics and salt transport in Rock Slough and neighboring channels were reviewed. Historical electrical conductivity measurements (EC) at Contra Costa Water District's Pumping Plant No.1 (PP1)[2] and two Old River stations close to the Rock Slough junction, one to the north[3] and one to the south[4] were compared to illustrate water quality changes along Rock Slough and the Contra Costa Canal. In the two years of record shown (1995 and 1996), there were times when the EC at PP1 was more than 0.5 mS/cm (corresponds to over 100 mg/L chloride) higher than those at the Old River stations. The difference in salinity was most pronounced in the winter months (February through April) in both years. A more detailed discussion on this water degradation is given in Attachment A. Some potential mitigation measures are discussed (see Attachment B). A number of questions were raised and are categorized as follows.

[1] Federal appropriations for the CALFED program in fiscal year 2000 is $60M, of which $30M is earmarked for ecosystem restoration, and approximately $15M for water management/acquisition and the Tracy fish screen experiment.
[2] Pumping Plant No.1 is at the end of the unlined portion of the Contra Costa Canal about four miles from Rock Slough.
[3] Old River at Holland Tract, CDEC station *HLL*.
[4] Old River at Bacon Island, CDEC station *BAC*.

Magnitude of water quality impacts attributable to the Veale Tract discharge There is very limited data on the quantity and quality of the Veale Tract drainage. It is difficult to assess the magnitude of its water quality degradation as opposed to those from other discharges in the area.

- The measured water quality degradation (as indicated by EC data) along Rock Slough and the Canal has not been compared to actual drainage discharge or agricultural activity in Veale Tract at the time. No storm runoff data are available.
- The seasonal variation of the impact at PP1 has to be investigated further. It is not clear if the smaller increase in salinity along Rock Slough in the summer and fall months were due to a higher pumping rate or a smaller source of degradation, or both.

Other sources of degradation in the area There could be other sources of drainage into Rock Slough and the unlined portion of the Contra Costa Canal. The quantity and quality of these discharges are unknown at this time.

- The soil in the Knightsen area (to the west of Veale Tract) is high in salt and sulphate. Its drainage, both through surface discharges and groundwater seepage, could be a significant source of degradation of water quality in Rock Slough and the Contra Costa Canal. There is an earlier study on groundwater flow in the area which should be consulted.
- CCWD believes that Veale Tract drainage is by far the major source of degradation between Old River and PP1. Analysis of the measurements in January 1982 shows that about 7% of the Rock Slough water came from Veale Tract drainage and accounted for over 60% of the salinity increase from the Old River junction to PP1.
- CCWD is progressing with a historical salinity analysis of five stations[5] along Rock Slough and Contra Costa Canal to better assess the sources of degradation in these two channels. Preliminary results could become available in December 1999.

Use of Los Vaqueros Project as mitigation The possibility of using CCWD's alternate diversion point on Old River and/or using releases from the Los Vaqueros Reservoir at times of high salinity in Rock Slough was raised. This is not considered feasible for the following reasons:

- When PP1 is not pumping, the high salinity drainage water will accumulate in Rock Slough. Tides cause this drainage to slosh back and forth, but the dispersion out of the channel is slow. Salinity in the channel will continue to build, and a large portion of the salt load will reach PP1 when pumping resumes. The net salt load impact on CCWD's water supply will not decrease substantially just by avoiding pumping at times of high drainage discharge from Veale Tract.
- The Biological Opinion for the Los Vaqueros Project issued by the U.S. Fish and Wildlife Service requires that biological monitoring data be used as a main criterion for determining whether the Rock Slough or the Old River intake is to be used. CCWD has limited operational flexibility.
- The pumping cost for diversion from the Old River intake is substantially higher, by $10 to $30 per acre-foot.

[5] The five stations are at PP1 (a CCWD station), Contra Costa Canal at Rock Slough junction (a DWR EC and stage station), Delta Road Bridge on Rock Slough near Sand Mound Slough (a CCWD station), and Old River at Holland Tract and Bacon Island.

- Any reduction in storage in the Los Vaqueros Reservoir could reduce the performance of the Los Vaqueros Project in providing environmental benefits and towards meeting CCWD's delivered water quality goal of 65 mg/L chloride.

Additional mitigation options In addition to the alternatives discussed in Attachment B, the possibility to store storm runoffs and time discharge operations to more favorable hydrological conditions was raised. However, no storage locations were apparent and the storage capacity required could be substantial for withholding up to 6 weeks' discharge. Further quantifying the relationship of pump discharge and storage requirement to rainfall would be needed.

Regional solution Suggestions were made that CALFED should look for a more comprehensive long-term solution to address all drainage on the west side of Old River from Clifton Court to the south to Franks Tract to the north. Quantifying the volume and quality of all drainage discharges in the area, and the watershed contributing to each discharge, would be a first step.

Byron Tract

An overview of the drainage facilities and operations of Reclamation District 800 was provided by Jeff Conway (RD 800). Most of the drainage is from irrigation tail water, but rain runoff in the winter could be substantial. The drainage flows by gravity to a pumping facility located at Old River approximately 800 feet south of the Los Vaqueros intake. Three pumps (rated at 11 cfs, 15 cfs, and 19 cfs) run either singly or in combination to pump the drainage through three closely placed parallel pipes. Pumping operation is determined by water level in drainage canal, and peak electricity rate periods are avoided to the extent possible. Treated wastewater from the Discovery Bay Wastewater Treatment Plant (DBWWTP) enters the same drainage system but accounts for only a small percentage of its volume, on the average. A second discharge into Indian Slough to the north is separated from agricultural drainage by a dam and serves only to re-circulate the water in Discovery Bay.

Discovery Bay Community Service District

Virgil Koehne (DBCSD) gave an overview of current operations of the Discovery Bay Wastewater Treatment Plant. The plant serves 4000 homes in Discovery Bay and discharges an average of 1.3 MGD of secondary treated effluent into a drainage ditch of Reclamation District 800. Disinfection is by ultra-violet irradiation. Additional facilities are planned to increase the capacity to 2.1 MGD.

The effluent is high in dissolved solids (average 1400 mg/L TDS) because of the high salinity of the service area's source water (from local ground water) and the widespread use of water softeners to treat the hardness of this groundwater supply. The latest NPDES permit requires a salinity management plan. It also imposes strict limits on copper and ammonia which would be difficult to comply.

The Community Service District is investigating the use of wetlands to treat its effluents to remove a variety of pollutants. Ongoing experiments conducted by the Sacramento Regional County Sanitation District (averages 1 MGD of effluent in 22 acres) achieve about 50% reduction in mercury and copper. Some existing farmland nearby (about 53 acres) might be available to be converted to wetland for this purpose.

Impacts of RD 800 discharge at CCWD's Old River intake

The flow and salt transport in the reach of Old River from the RD 800 outfall to the Los Vaqueros intake were reviewed. The RD 800 outfall extends only a short distance from the shore. During the tide cycle when Old River flow is to the north, the plume from the outfall is bent into the direction of the river flow and stay close to the shore. A recent study using Rhodamine W-dye as tracer shows that the plume would stay close to shore until the next bend in the river, to the north of the Los Vaqueros intake. Beyond the bend, the plume becomes well mixed across the entire channel cross-section. The fact that the plume stays close to the shore at the intake means that a substantial fraction of the drainage could be diverted into the CCWD water supply. The dye measurements and additional numerical simulations show that the near-shore dispersion could limit dilution to the order of 10:1 at the intake, while the dilution would be over 100:1 if the discharge had been well-mixed across the channel.

EC measurements at the intake show sporadic increases of a large magnitude (up to 40 mg/L chloride). These EC spikes are found when flow in Old River is to the north (see Attachment C for details). A sample taken in May 1999 showed a drainage EC of over 2 mS/cm (500 mg/L chloride). It is likely that the EC increases are at least in part caused by the RD 800 drainage.

The impact at the Los Vaqueros intake could be reduced substantially if the dispersion characteristics of the existing RD 800 discharge could be altered. This can be accomplished in two ways. The outfall could be modified such that the plume either (1) becomes well-mixed over most of the channel cross-section by the time it passes the intake, or (2) disperses away from the intake. The latest results from an ongoing study suggest that there could be a reduction of 90% using either approach. A project to modify the outfall could be a strong candidate for CALFED's early implementation program by improving the water quality of a significant Delta drinking water supply. These and other potential improvement actions are discussed in Attachment D. There is general consensus that a more comprehensive solution that would reduce pollutant loads into Delta channels should also be planned as a long-term regional solution.

Potential benefits to stakeholders

In addition to improving water quality at CCWD's two intakes, many of the alternatives discussed in Attachments B and D could improve existing drainage operations by providing funding for upgrading existing or installing new pumps and improve conveyance ditches. Newer, more efficient pumps could reduce power cost by up to one-third. Concerns regarding maintaining local control were raised.

Summary

Two distinct solution approaches emerged in the meeting. For early implementation actions in the CALFED program, modifying the existing outfall of RD 800 could be a cost-effective

measure to reduce its adverse impacts on water quality at the Los Vaqueros intake. No single action appears clearly superior for Veale Tract and the feasibility of a number of actions discussed in Attachment B requires further investigation. CALFED should also start planning for a long term, regional solution that would work towards reducing pollutant loads into the Delta. The Habitat Restoration Program in CALFED should be closely tracked for opportunities in using wetland for drainage treatment.

Attachments

Note: Data for Figures A-1, C-1 and C-2 are available from Judy Heath upon request.

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Attachment A

Water Degradation along Rock Slough and the Contra Costa Canal

High salinity at CCWD's Delta intakes is due to seawater and/or agricultural drainage. Seawater intrusion can be reduced only by costly measures such as increasing Delta outflow or major changes in Delta channels. Salinity impacts due to agricultural drainage, on the other hand, can be mitigated to a significant extent by pretreatment or by relocating those discharges that have the greatest impacts on CCWD.

Salinity due to agricultural drainage can be distinguished from that due to seawater by the different relationship between its electrical conductivity (EC) and chloride (or the concentration of other dissolved solids). Agricultural drainage at interior Delta stations such as Rock Slough can also be identified when the salinity at an interior station is higher than that at more seaward stations (e.g. at Jersey Point).

The major sources of agricultural drainage reaching CCWD's intakes are farmlands on Delta islands and in the watershed of San Joaquin River. The salinity and volume of individual drainage vary considerably, both seasonally and geographically. Typically, discharges from Delta islands have the highest salinity when the fields are leached in winter months. Salinity in the San Joaquin River decreases as flow increases.

Most of the agricultural drainage discharges are well mixed in the channel water by the time they reach CCWD's intakes, and only a small fraction of the agricultural drainage from distant sources is actually diverted at CCWD's intakes. Results from numerical simulations suggest that distant sources of agricultural drainage total up to a few percent in CCWD's water supply, depending on the Delta hydrology at the time. However, discharges in the immediate vicinity of CCWD's Rock Slough intake would have a major impact on the quality of CCWD's water supply, leading to significant increases in salinity and other contaminants. Mitigation of these sources would lead to a substantial improvement in the water quality of CCWD's supply.

The tidal flow and salt transport in Rock Slough and neighboring channels are discussed in this Attachment. The flow and transport in the area are such that a high salinity agricultural drainage discharged into Rock Slough leads to a disproportionate water quality degradation on CCWD's drinking water supply. Improvement on this existing condition is one of the highest priority in the Early Implementation Action in CALFED's Water Quality Program.

Drainage Impact

The Rock Slough intake to the Canal is located in the west-central Delta in the vicinity of Knightsen in eastern Contra Costa County. The land surrounding Rock Slough is primarily agricultural. Water level in Rock Slough is subject to tidal variations, typically with a daily range of about 3.5 feet. Rock Slough salinity is high when there is seawater intrusion from San Pablo Bay during periods of low Delta outflow, or when agricultural drainage discharges from the Delta and the San Joaquin River are high. Seawater intrusion typically occurs during the

summer months in dry years and fall months in most years. Both the volume and the salinity of Delta drainage are highest during leaching periods, usually after winter storms. In particular, local drainage has in the past increased the salinity at the Contra Costa Canal Pumping Plant No.1 (PP1) intake to 130 mg/L chloride when the salinity at the entrance to Rock Slough was only 20 or 30 mg/L chloride. The main impact of agricultural drainage is to increase dissolved solids, TOC, and possibly pathogens at the intake.

Two dominant processes govern the flow in Rock Slough and the Contra Costa Canal. Tidal effects induce an oscillatory flow which carries a portion of the agricultural drainage in Rock Slough to Indian Slough and Sand Mound Slough. At the same time, CCWD's diversion at PP1 induces a mean flow in Rock Slough towards the Contra Costa Canal and carries the rest of the agricultural drainage in Rock Slough to CCWD's intake. At times of high CCWD diversion, a major portion of the agricultural drainage in Rock Slough is drawn into the Canal. However, this drainage is diluted by the time it reaches Pumping Plant No.1 at the Canal.

Two measurements of drainage water quality from Veale Tract are available. The total dissolved solids concentration was 2,160 mg/L in a December 1981 grab sample and 3,560 mg/L in a January 1982 sample. The January 1982 measurement also showed a chloride concentration of 1,014 mg/L and a sodium concentration of 770 mg/L. The volume of drainage is not known, but even a limited discharge rate (e.g. 5 million-gallons-per-day) of this high salinity drainage can lead to a substantial increase in chloride in CCWD's water supply. This drainage could contribute to a number of rapid and sharp increases in chloride at PP1 at the time when the Delta had relatively good water quality. For example, chloride concentration at Pumping Plant No. 1 increased from 57 mg/L on January 12, 1982 to 105 mg/L on January 15 when that in Old River at Holland Tract remained in the 30's. Simultaneous measurements on January 20, 1982 showed that the chloride concentration increased from 27 mg/L in Old River at Holland Tract to 91 mg/L in Rock Slough near the Sand Mound Slough junction, to 131 mg/L at Pumping Plant No.1.

More recent measurements are shown in Figure A-1 for the calendar years 1995-96. Mean daily electrical conductivity (EC) at Pumping Plant No. 1 is compared to those at Old River at Bacon Island (near Santa Fe Railway Cut) and Holland Tract (near the junction of Sand Mound Slough and Piper Slough). The two latter stations give an estimate of the salinity in Rock Slough at Old River. In both years the EC at Pumping Plant No.1 was higher than that in Old River in the winter months. The periods of maximum salinity difference correlated with periods of high precipitation, when the farmlands in the Delta are usually leached and discharge high salinity drainage into Delta channels.

Water quality data on the Veale Tract drainage suggest that the discharge can increase chloride concentration at the intake by tens of mg/L. For example, a 5 MGD (7.7 cfs) discharge from Veale Tract, at a chloride concentration of 750 mg/L, would increase chloride at PP1 from 30 mg/L to 54 mg/L chloride.[6] The actual drainage from Veale Tract could be much higher.

[6] For a rate of diversion at PP1 of 75 MGD (116 cfs), typical in winter months, and assuming that half of the Veale Tract discharge reaches the intake.

Attachment B

Potential Water Quality Improvement Actions for Veale Tract

The following is a partial list of mitigation possibilities that could be considered in the CALFED Water Quality Program. None of these options have been considered for adoption or are sanctioned by CALFED or any other agencies.

Relocation

The discharge point of the Veale Tract drainage in Rock Slough could be relocated. Some alternative discharge locations are:

- *Holland Tract* A siphon could be installed underneath Rock Slough to connect the existing Veale Tract pump station at Rock Slough to the closest drainage ditch in Holland Tract. The Holland Tract drainage is eventually discharged into Sand Mound Slough at Piper Slough at Franks Tract. While no quantitative analyses have been made, the hydrological conditions and transport characteristics in the region are such that the amount of Veale Tract drainage reaching PP1 could be reduced by over 90%.

- *No Name Cut or Werner Cut* There are two other drainage pump facilities in Veale Tract. One discharges into No Name Cut at the southern end of Veale Tract, and the other discharges into Werner Cut to the east. Numerical simulations for a limited range of hydrology show that using these two pumping facilities exclusively (and shutting down the Rock Slough discharge) could reduce the drainage from reaching PP1 by 60%.

- *Sand Mound Slough* A pipe could be installed to convey drainage from the existing Veale Tract pump station at Rock Slough to immediately north of the one-way flow gates in Sand Mound Slough. This would likely reduce the drainage reaching PP1 by 90% or more. Preliminary cost estimates suggest that it would be a multi-million dollar project.

- *Marsh Creek* A pipe could be installed to convey drainage from the existing Veale Tract pump station at Rock Slough to a point below the existing discharge location of the Brentwood wastewater treatment plant. This would likely reduce the drainage reaching PP1 by 90% or more. The cost, however, could be prohibitive.

Water quality impacts in the affected waterways and impacts on agricultural and other beneficial uses, in particular in Holland Tract and Hotchkiss Tract, would need to be carefully analyzed in all of these alternatives.

Managing the timing of drainage discharge

The percentage of Veale Tract drainage reaching PP1 could be reduced if it is released only when the flow in Rock Slough is away from PP1. The effectiveness of this alternative has yet to be quantified, as the typically high summer pumping at PP1 could cause the flow in Rock Slough

to be towards PP1 during most of a tide cycle. Even though operation of the new Los Vaqueros intake at Old River could reduce the pumping at PP1 somewhat, this alternative could severely limit the operational flexibility of both CCWD and Veale Tract.

Treatment of drainage

Wetland disposal The Veale Tract drainage could be discharged into existing or created wetlands which would remove some constituents of concern to drinking water agencies such as organic carbon and pathogens before the water is discharged into Delta channels. Availability of wetland and integration with the ecosystem restoration program in CALFED should be explored.

Reverse osmosis The drainage could be treated through advanced treatment such as reverse osmosis and the water could be reused for irrigation. The seasonal fluctuation of the drainage might make it difficult to size an effective and cost-efficient facility. At a current cost of $250 to $650 per acre-foot (AF), a drainage of 3,000 AF (Veale Tract is approximately 1,300 acre) would cost between $750,000 to $1,950,000 per year for complete treatment. Storage ponds for high intensity winter runoffs would be necessary.

Controlling flows in Rock Slough

Increase inflow from the Old River A larger flow from Old River into Rock Slough could achieve a higher dilution of the Veale Tract drainage. This might be achieved by increasing the flow through the existing flow control structure in Sand Mound Slough, for example by increasing the size and number of culverts. The same head difference across the structure would then lead to a higher volume flow out of Rock Slough, thus drawing water in from the Old River.

Separating Veale Tract drainage from inflow to the Contra Costa Canal A one-way flow barrier that allows flow from west to east only at the Delta Road Bridge would prevent the Veale Tract drainage from reaching PP1. This structure could be operated in tandem with the existing flow control structure in Sand Mound Slough such that water is drawn into the Canal through either Sand Mound Slough or Rock Slough based on the water quality in the two channels. The improvement this could achieve has yet to be quantified and could be limited since Sand Mound Slough is likely to have a worse water quality than Rock Slough under most conditions. Drainage from Holland Tract and Hotchkiss Tract could lead to a high salinity in Sand Mound Slough at the same time drainage from Veale Tract leads to a high salinity in Rock Slough. Other issues to be addressed include impacts on navigation, recreation, fishery, and other beneficial uses.

Attachment C

Water Degradation at the Los Vaqueros intake

Contra Costa Water District has installed and operated continuous electrical conductivity (EC) measurements at the Los Vaqueros intake since May 1998. Sporadic spikes with amplitudes between 50 and 150 μS/cm (between 10 and 40 mg/L chloride) and lasting between 2 to 8 hours have been regularly recorded (Figure C-1). The tidally-averaged EC ranged between 220 and 275 μS/cm (60 and 70 mg/L chloride). This attachment discusses some of the characteristics of these sporadic spikes in EC measured at the LV intake. In particular, these analyses show that the sporadic EC increases:

- were not due to sea water intrusion, salt load variations in the San Joaquin inflow, or Delta agricultural drainage discharged far from the intake
- always started during ebb tide (when flow in the Old River was to the north)
- could be caused by discharges into the Old River south of the Los Vaqueros intake

Effects of sea water intrusion and salt load in the San Joaquin River inflow

The EC measurement at LV was compared with hourly data (from CDEC) taken at Old River at Bacon Island and Middle River at Victoria Canal (Figure C-2). The EC variations at both of these nearby stations were much smaller in amplitude than the sporadic spikes found at LV.

The EC in Old River further north was consistently below the peak values of the EC anomalies at LV. The EC anomalies could not be due to tidal action and sea water intrusion.[7] Similarly, the EC in Middle River at Victoria Canal was much lower than the spikes in LV EC. The anomalies were unlikely to be caused by varying salinity in the San Joaquin River inflow[8] or drainage into south Delta away from the LV intake (e.g. into Middle River). No flow barriers were operating in south Delta due to the high flow at the time.

Likelihood of Local Agricultural Drainage Causing the EC Anomalies

The EC anomalies happened mostly when Old River flow was to the north. The high salinity water might originate from agricultural drainage from the south, and in particular the nearby discharges of Reclamation District 800 (RD800, Byron Tract) and Victoria Island.

The EC anomalies had amplitudes in the range of 30 to 80 mg/L TDS.[9] The background salinity (in between the anomalies) was around 150 mg/L TDS (approximately 20 mg/L chloride). An EC measurement taken in May 1999 from the drainage pond at the pump facility in Byron Tract was over 2 mS/cm or 1,000 mg/L TDS. A dilution as high as 1:17 could lead to an increase in salinity at the LV intake from 150 to 200 mg/L TDS.

[7] Delta outflow had been high in the preceeding months and was above 60,000 cfs in May 1998.
[8] Between May 7 and 22, 1998, the San Joaquin River inflow varied between 16000 and 19000 cfs and EC varied between 140 and 200 μS/cm.
[9] Based on linear regressions obtained by Richard A. Denton.

Attachment D

Water Quality Improvement Actions for Byron Tract

A number of possibilities could be considered as part of the CALFED Water Quality Program. The following is an incomplete list and none of the options discussed have been considered for adoption or are sanctioned by CALFED or any other agencies.

Outfall Improvement

The impact at the Los Vaqueros intake could be reduced substantially if the near-shore dispersion of the existing RD 800 discharge could be avoided. This can be accomplished in at least two ways:

- *Construct a diffuser* A properly designed diffuser would allow near complete mixing of the discharge over most of the channel cross-section by the time it passes the intake. The reach of Old River is subjected to periodic sedimentation which could clog up the diffuser ports. Dredging operations could add to the maintenance cost, perhaps significantly. Boat anchoring would also have to be prohibited in the vicinity to avoid potential damage to the diffuser.

- *Extension of existing outfall across the river* An extension of the outfall to assure that the emerging plume disperse away from the Los Vaqueros intake could require less maintenance cost. The discharge pipe could be buried deep in the river bed to avoid interfering with dredging operations.

The latest results from an ongoing consultant study suggest that there could be a reduction of 90% using either approach. A project to modify the outfall could be a strong candidate for CALFED's early implementation program by improving the water quality of a significant Delta drinking water supply.

Relocation

The discharge point of the Byron Tract drainage could be relocated. Some alternative discharge locations are:

- *Italian Slough* A new pump facility could be constructed at the south end of the existing drainage ditch to discharge into Italian Slough. Even though this could almost eliminate the drainage's impact on CCWD's Los Vaqueros intake, most of this redirected drainage could be exported through Clifton Court Forebay.

- *Indian Slough* A new pump facility could be constructed at the north end of the existing drainage ditch to discharge into Indian Slough. This alternative, however, has been rejected by voters in Discovery Bay in 1972.

- *Old River* A recent study shows that the existing RD 800 discharge becomes well-mixed over the channel cross-section after the bends both to the north and to the south of the reach of Old River where the Los Vaqueros intake is located. Relocation cost (conveyance and pumping facilities) could be substantial and the reduction in impact to the Los Vaqueros intake is not likely to be higher than modification of the existing outfall structure.

None of these relocation alternatives appear to be promising and are not recommended for further studies as early implementation action at this point.

Managing the timing of drainage discharge

The Byron Tract drainage reaching the Los Vaqueros intake through near-field dispersion could be reduced if it is released only when the flow in Old River is to the south (away from the intake). The impact on water level in the drainage ditch and any additional power cost need to be quantified.

Treatment of drainage

Wetland disposal The Discovery Bay treated wastewater effluent could be discharged into existing or created wetlands areas, which would remove some constituents of concern to drinking water agencies such as organic carbon and pathogens before the water is discharged into Delta channels. Availability of wetland and integration with the ecosystem restoration program in CALFED should be explored.

Reverse osmosis Alternatively, the drainage could be treated through advanced treatment such as reverse osmosis and the water could be reused for irrigation. The seasonal fluctuation of the drainage might make it difficult to size an effective and cost-efficient facility. At a current cost of $250 to $650 per acre-foot (AF), a drainage of 15,000 AF (Byron Tract is approximately 7,000 acre) would cost between $3,750,000 to $9,750,000 per year for complete treatment.

One approach would be to reduce the hardness in addition to reducing manganese in the water treatment plant now under design, thereby eliminating the need for home water softeners.

Figure A-1. Salinity in Rock Slough Vicinity

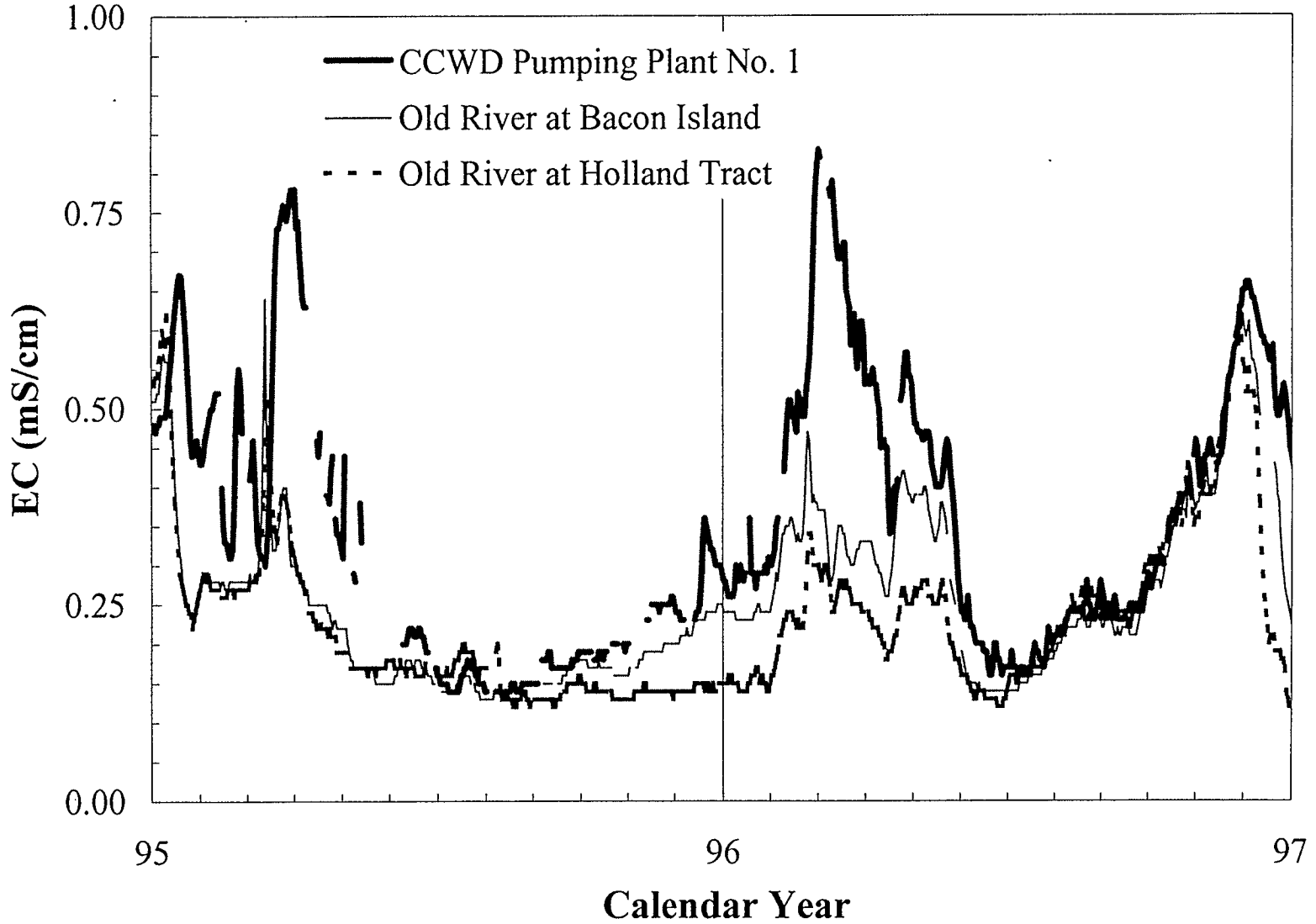

Figure C-1. Salinity at Los Vaqueros Intake

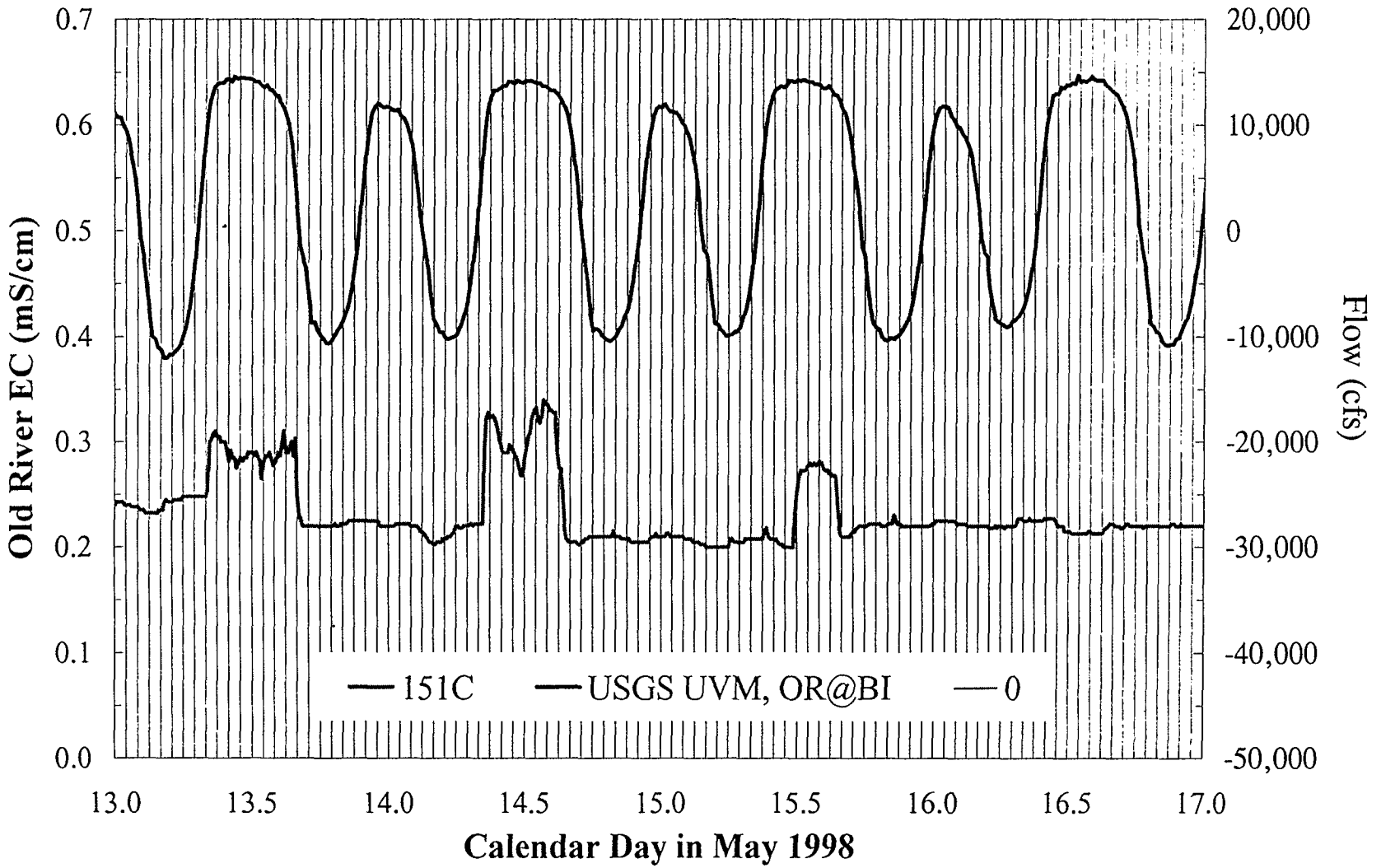

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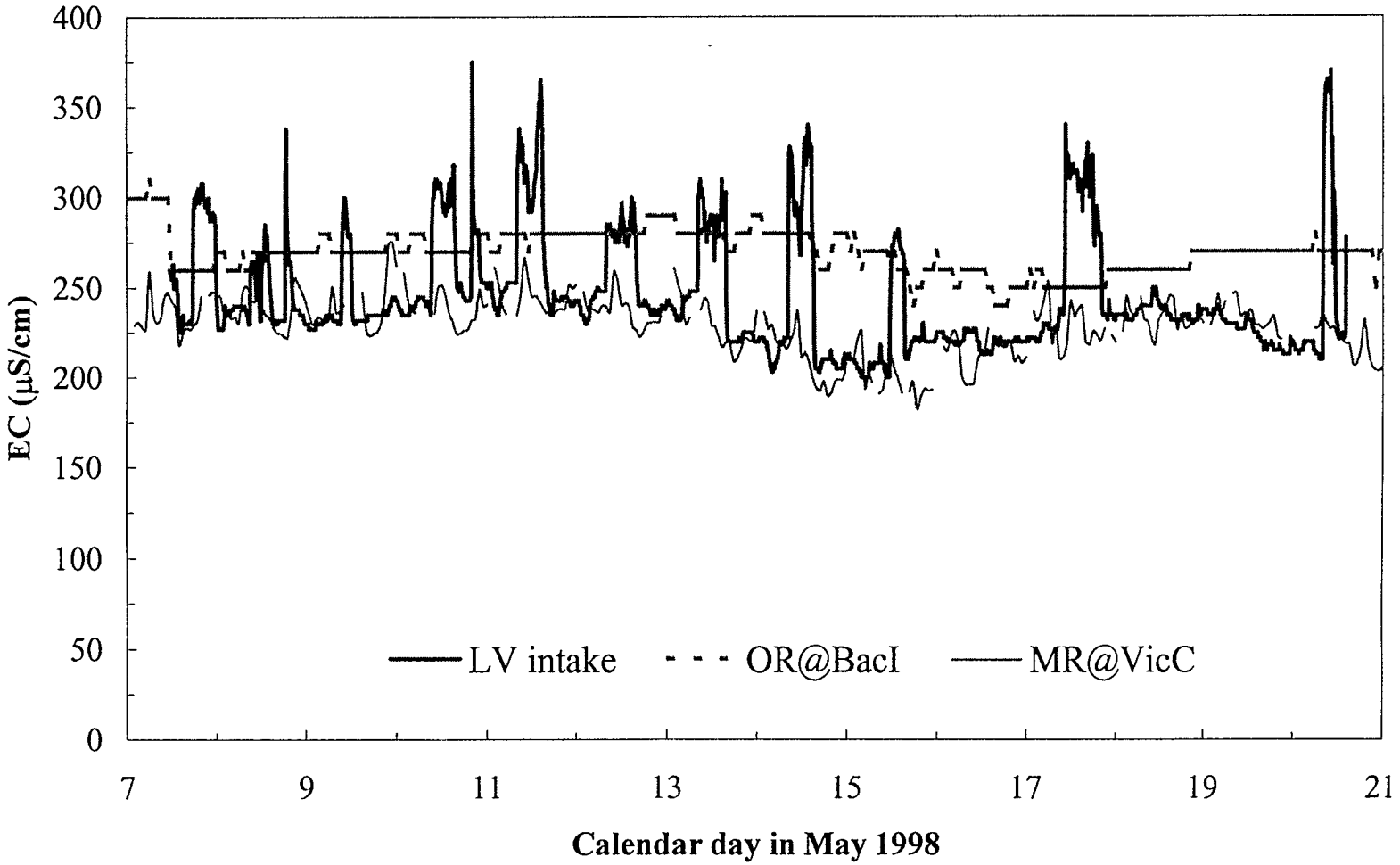
Figure C-2. EC Measurements at LV and Nearby Stations



Assessment of Water Quality Improvement Action Alternatives for Veale Tract in CALFED Water Quality Program		Effectiveness	Redirected Impacts	Cost	Time frame for Implementation	Load Reduction
Relocation	Holland Tract (north side)					
	No Name Cut/Werner Cut					
	Sand Mound Slough					
	Marsh Creek					
Manage Timing of Discharge						
Drainage Treatment	Reverse Osmosis					
	Wetlands					
Manage flows	Install gate at Delta Road Bridge					
	Modify culverts to Sand Mound Slough					

Contact information:

Name / Agency: _____

Phone / Fax / email: _____

Ratings for Effectiveness, Redirected Impacts, Cost, and Source Reduction:
H – High M – Medium L – Low

Key for Time frame for Implementation:
E – Early Implementation 1 – Stage 1

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Assessment of Water Quality Improvement Action Alternatives for Byron Tract in CALFED Water Quality Program		Effectiveness	Redirected Impacts	Cost	Time frame for Implementation	Source Reduction
Outfall Improvement	Diffuser					
	Extension					
Relocation	Italian Slough					
	Indian Slough					
	Old River up/downstream					
Manage Timing of Discharge						
Drainage Treatment	Reverse Osmosis					
	Wetlands					

Contact information:

Name / Agency: _____

Phone / Fax / email: _____

Ratings for Effectiveness, Redirected Impacts, Cost, and Source Reduction:
H – High M – Medium L – Low

Key for Time frame for Implementation:
E – Early Implementation 1 – Stage 1

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